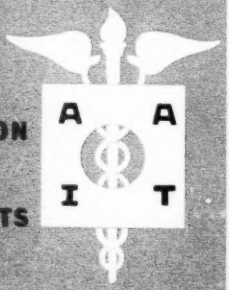
Inhalation Therapy

JOURNAL OF THE
AMERICAN ASSOCIATION
OF
INHALATION THERAPISTS



JUNE 1955 — VOL. 3 NO. 2

BENNETT MODEL PR-1A RESPIRATOR

- **HOSPITAL RESUSCITATOR**—for long term or emergency use. The PR-1A maintains or insures respiration by setting a single control.
- **IPPB UNIT**—for intermittent positive pressure breathing, the PR-1A matches in function and operation the familiar Bennett Therapy Units.
- **FLOW-SENSITIVE**—even with the PR-1A on automatic cycling, a patient can take over at will with his own respiratory pattern. Semi-conscious patients, unable to coordinate well, are assisted automatically. These features are made possible by the unique Bennett Valve.
- **ADAPTABLE**—Uses oxygen or air from piped source or cylinder. Features include simple pedestal mount, adjustable aspirator, air/oxygen diluter, and large nebulizer for long term use.

Model PR-1A Respiration Unit — $550.00, FOB Los Angeles

Write for literature or demonstration

BENNETT RESPIRATION PRODUCTS, INC.

2230 So. Barrington Avenue • Los Angeles 64, California

Distributed East of the Continental Divide by Puritan Compressed Gas Corp.

Vol. 3, No. 2 June, 1958

AMERICAN ASSOCIATION OF INHALATION THERAPISTS

"Inhalation Therapy"

"Inhalation Therapy" is the official publication of the American Association of Inhalation Therapists, an organization of therapy technicians working in hospitals, for firms providing emergency therapy service and for municipal organizations. The Association is sponsored jointly by the American College of Chest Physicians and the American Society of Anesthesiologists. Contents include news and information pertinent to the profession including medical research, operative techniques, and practical administration.

CONTENTS

EDITORIAL OFFICE
260 Crittenden Blvd.
Rochester 20, New York

Editor
JAMES F. WHITACRE

Managing Editor
ALBERT CARRIERE

Production Manager
ELLIS MURPHY
332 South Michigan Ave.
Chicago 4, Illinois

Advertising Representative
Samuel N. Turiel & Associates, Inc.
750 North Michigan Avenue
Chicago 11, Ill.

ASSOCIATE EDITORS

DON E. GILBERT, Ann Arbor, Mich.
SISTER YVONNE, LaCrosse, Wisc.
ROBERT KRUSE, Oak Park, Ill.
JACK SANGSTER, Montreal, Que.

"Inhalation Therapy" is published quarterly by the American Association of Inhalation Therapists at 332 South Michigan, Chicago 4, Illinois. Established in 1956. Single copy $1.00; subscriptions $3.00 per year to non-members and $2.00 per year to members (included in dues).

A PROGRESS REPORT

STANDARDS OF EDUCATION AND TRAINING

By JOHN HINMAN, M.D.*

THE COUNCIL on Medical Education and Hospitals of the American Medical Association has accepted, with minor revisions, the proposed standards of education and training developed to date as a tentative, or suggested guide for the establishment of schools for inhalation therapists on an experimental basis.** Later this month the Council plans to survey a selected list of hospitals to determine their interest in establishing schools, and inviting them to use the proposed standards[1] in their work. Those hospitals establishing schools will be invited, in effect, to take part in the council's continued study of education and training for inhalation therapists. The hospitals will be asked to report on the use of the suggested guides, and to make comments and recommendations on the need and effectiveness of the training under the suggested curriculum.

The council's survey and continued study will provide a more definitive concept of the function of the inhalation therapist, and of how he should be trained. The comments and recommendations coming from the hospitals establishing schools will be incorporated into the final report, which will be given by the Council on Medical Education and Hospitals, to the House of Delegates after two or three years of observation of the use of the suggested guides. If this report is adopted by the House of Delegates, a definite standard of education and training for therapists will come into existence.

The development of such standards will, it is hoped, lead to a better understanding of the practice of inhalation therapy on the part of doctors, hospital administrators, nurses and members of other paramedical specialty groups.

Improved techniques and administration of inhalation therapy are recognized as one facet of total patient care and are thus of considerable interest to the recently formed Joint Committee of the Board of Trustees and the Council on Medical Education and Hospitals of the A.M.A. This joint committee has representation from the Council on Mental Health, and will "consider how physician leadership can best be activated in relationships with professional and technical personnel closely related with medicine." This committee will study the matter of liaison at the professional and technical levels leading to the objective of better patient care.

---

*Council on Medical Education and Hospitals, A.M.A.

**See "Inhalation Therapy," Vol. 1 #3, August, 1956.

Scope of Paramedical Groups

Complete data are not available on the total number of persons in various groups of paramedical personnel who, under the supervision of physicians, participate directly and indirectly in the care of hospitalized patients. Sufficient data are available to demonstrate the tremendous growth of such participation. In the last 11 years, from 1946 to 1956, "the increase in full-time personnel for all hospitals" (reporting to the A.H.A.) "was 66% . . . nearly 6% in the last year of the period."[2] "For all hospitals there were an average of 28 more personnel per 100 patients in 1956 than in 1946, and an average of 6 more in 1956 than in 1955. . . . In the non-profit short-term hospitals, with the highest personnel: patient ratios, the increase was from 156 to 213 per 100 patients, or 37% during the past 11 years."[2]

Many of these approximately 1.5 million employees were not participating directly in patient care. However, if sufficient statistical data were available, it would probably show that the greater proportion would be in the group participating, under physicians' supervision, in direct patient care.

Present Status

Comprehensive medical care has become possible through the development of an increasingly large and complex team of health personnel. Active liaison between physicians and their professional organizations and related professional and technical groups has been effected in many areas. There are – as variously estimated – approximately 60-70 paramedical groups organized nationally. Some do not have close liaison with those in closely related areas. There is growing concern among physicians and related professional groups that coordinated total care of the patient—already complex, may become a great deal more so, if a trend of segmentation and subspecialty separation continues in the health professions.

Recognition of these complexities of the total responsibilities facing members of the health professions, facing each member as he works with others, and each group as one part of the whole, is essential to place in perspective the following record of the Council's study on education and training for inhalation therapy technicians.

June 1956: Request for Study

At the annual meeting of the A.M.A. in June 1956, the Medical Society of the State of New York introduced the following resolution:

"*Whereas,* There are insufficient numbers of physicians and technicians who have been well-trained in the techniques of inhalation therapy in many parts of the United States of America; and

Whereas, The effective use of inhalation therapy may be the determining factor between life and death in such cases as heart failure, coronary artery disease, asthma, atelectasis of the lungs in newborn infants, postoperative atelectasis, pneumonia, pulmonary edema, emphysema, cerebral thrombosis, and others; and

Whereas, "Standards of Effective Administration of Inhalation Therapy" were published in the Journal of the American Medical Associa-

tion of September 2, 1950 (Vol. 144, pp 25-34); and

Whereas, "Essentials of an Acceptable School for Inhalation Therapy Technicians" were published in the New York State Journal of Medicine of April 15, 1956 (Vol. 56, p. 1319); therefore be it

Resolved, That the Council on Medical Education and Hospitals is hereby requested to endorse such or similar "Essentials," and to stimulate the creation of schools of inhalation therapy in various parts of these United States of America."

The resolution was adopted, in principle, by the House of Delegates, and referred to the Council for study.

August-November 1956: Preliminary Study

To assist the Council in its study, additional information on several sections of the educational criteria proposed by the Joint Committee on Inhalation Therapy of the Medical Society of the State of New York and the New York Society of Anesthesiologists was requested from the Joint Committee. Also, national medical organizations were asked whether these groups considered that educational criteria were indicated, and if so, with what groups in medicine these training criteria should be developed. The American College of Chest Physicians and the American Society of Anesthesiologists expressed interest in developing such criteria.

During the early winter of 1957, there was a meeting of an exploratory joint committee on Paramedical Groups of the Council on Medical Education and the Council on Professional Practice of the American Hospital Association. This joint group considered that "further definition and study of Inhalation Therapy was indicated prior to establishment of training standards, and that integration of such specialized training within existing closely related educational programs should be encouraged."[3]

February 1957: Continued Study

In February, the Council accepted this recommendation, and deferred further action because it had been advised that a joint meeting would be held in May, 1957, by committees on Inhalation Therapy of the American College of Chest Physicians and the American Society of Anesthesiologists.

The joint recommendations of the ACCP and the ASA were not received in time for consideration by the Council in June of 1957. Accordingly, an exploratory conference to consider (1) the need for inhalation therapy technicians and (2) a critical review of the criteria recommended was held last September 14th. Representatives of the American Academy of Ophthalmology and Otolaryngology, American Academy of Orthopaedic Surgeons, American Academy of Pediatrics, American Association for Thoracic Surgery, American College of Chest Physicians, American College of Physicians, American Neurological Association, American Psychiatric Association, and American Society of Anesthesiologists were present. The representative of the ACS was unable to attend.

It was the sense of the participants, attending the exploratory conference as individuals, that the

following thinking be conveyed to the Council:

1. **That there is a definite need for improving the techniques and administration of inhalation therapy;**
2. **That minimal criteria should be established for training inhalation therapy technicians at this time; and**
3. **That the "Essentials" proposed by the American College of Chest Physicians and American Society of Anesthesiologists (in May 1957) are a sound basis for further exploration and study by the Council.**

These recommendations initiated further definitive study of the proposed training criteria by the participants of the exploratory conference for subsequent referral to the Council. At a meeting of the Council last December, additional discussions were held and comments evaluated. The following paragraphs outline some of the comments that were evaluated at the December meeting, and a consensus of the action recommended.

As defined by the joint committee of the American College of Chest Physicians and American Society of Anesthesiologists,

"Inhalation Therapy is that therapy designed to restore toward normal, pathophysiologic alterations of gas exchange in the cardiopulmonary system. It aims at adequate oxygenation as well as elimination of carbon dioxide.

Such therapy is accomplished by means of the proper application of therapeutic gases, including oxygen, helium-oxygen, and carbon dioxide mixtures; the use of pressure breathing devices, resuscitators and respirators to promote artificial ventilation and respiration; the administration of aerosols to improve the airway of the pulmonary system by relieving bronchospasm, liquefying secretions and combating infections; and the use of artificial airways to relieve obstruction."

In reply to a question from the Council on what technicians would be trained to do, these two national medical groups considered that:

"The inhalation therapy technicians should be capable of complying with orders written by an attending physician regarding the following procedures:

a. Administration of gases by catheter, tents, hoods, etc.

b. The assembling and application to the patient of pressure devices, including those for IPPB (intermittent positive pressure breathing), expiratory pressure masks, respirators (Drinker and other types), and various resuscitators (Kreiselman, Emerson).

c. The instructions to the patient and assembly of equipment for aerosol therapy with respect to nebulizers, oxygen tanks and motor blowers.

In addition, the technician should be responsible for the maintenance, service, care and repair of the aforementioned equipment. He should also be responsible for the maintenance of records on all patients receiving inhalation therapy."[4]

In brief abstract, the "Essentials," as proposed, outline a curriculum of a minimum of nine months'

"theoretical instruction and practical hospital experience," for which "candidates for admission should satisfy one of the following requirements:

1. Completion of four years of high school. Courses in Biology, Physics, Chemistry, Algebra and Geometry are recommended.

2. Passing of a college entrance examination for admission to an accredited college or university.

3. Graduation from a school of nursing recognized by a State Board of nurse examiners."[4]

Schools would be in medical schools and hospitals approved by the Council, or in accredited universities or colleges affiliated with acceptable hospitals.

It has been suggested that the faculty shall consist of a physician-director "who has had specific training or experience in inhalation therapy," and at least one technician-instructor to every four students in the clinical practice rotations. Technician-instructors would be expected to have had three years of experience as inhalation therapy technicians.

The curriculum suggested comprises:

A. Applied Sciences—to include theoretical instruction in Anatomy, Bacteriology, Chemistry, Pathology, Physiology, Psychology and Physics. The American College of Chest Physicians and American Society of Anesthesiologists note as possible themes for lectures and discussions:

Anatomy: anatomy of the respiratory system; lectures on the structure of the nose and mouth; lectures on the circulatory system as a factor in oxygen transport; brief description of brain and spinal cord; reference to the architecture of the brain (to provide a background for discussion of the pathology of oxygen lack).

Bacteriology: Introductory lectures for a general grasp of the subject; lectures on the common bacterial organisms of the nose, throat and pulmonary system; discussions of the pathogenic bacteria; application of aseptic techniques and prevention of cross infection.

Physiology: Oxygen transport, ventilation, tissue metabolism.[4]

B. Procedures – to include theoretical and practical instruction on analyzers and tests, chambers and hoods, humidifiers and inhalators, humidity rooms, masks and catheters, tents and incubators, regulators and manifolds. Examples are:

Analyzers: several lectures would be devoted to the various apparatus available in determining the oxygen concentration in tents or breathing bags, the technic used; the mechanism of apparatus would be discussed and explained; simple instructions regarding repair would be formulated.

Masks & Catheters: The subject of catheter therapy alone would entail several lectures; the size of catheters, the preparation, maintenance and cleaning of catheters; the insertion of catheters with respect to anatomy, the limits of oxygen flow, the complications that can result with this therapy.

Regulators: Several lectures would be devoted to the construction of a regulator; the purpose of the regulator; the types of regula-

tors, the pressures which regulators allow; the regulators used in manifold systems; lectures on and demonstrations of piping systems and safety.[4]

C. Theoretical and practical instruction in Inhalation Therapy as applied to: Emergencies, Medicine, Obstetrics, Pediatrics, General, Thoracic and Neurosurgery. Examples would be:

"Inhalation Therapy Applied to Emergencies. Emergency Situations where Artificial Respiration both Mechanical and Manual are Useful.

The instruction in manual methods of respiration; application of resuscitator devices; treatment of acute asphyxia and carbon monoxide poisoning, etc.

Applications in Surgery would include postoperative oxygen therapy, treatment of distention, uses of gases in recovery room.

Obstetrics: Application of gases in delivery room; resuscitation of the newborn; care of Isolettes and other incubator devices; the transport of babies; use of oxygen and inhalation therapy in the premature nursery."[4]

D. Ethics and Administration.

E. Nursing Arts.

F. Clinical practice or Supervised hospital rotations for experience in various techniques.

Study of the education activity and suggested guides will, of course, be continuous throughout the formative period of the next two or three years. Those conducting educational programs will be consulted, because their comments and experience will be most valuable in continuing the study of standards of education and training for inhalation therapists.

REFERENCES

1. **New York State Journal of Medicine, Vol. 56, page 1319 (1956).**
2. **Hospitals, Journal of the A.H.A., August 1957.**
3. **Journal of the A.M.A., April 13, 1957, page 1365.**
4. **Memorandum from the ACCP to A.M.A. Council on Medical Education and Hospitals, May 30, 1957.**

TRI-STATE HOSPITAL ASSEMBLY

THE 28TH annual meeting of the Tri-State Hospital Assembly was held April 28-30 in the Palmer House in Chicago. As has been the custom for many years, the AAIT held sessions during this meeting in conjunction with the Inhalation Therapy Section of the Assembly.

Miss Dorothy Braeger, R.N., Supervisor of Inhalation Therapy at Milwaukee Hospital, and Larry Fruik, Supervisor of Inhalation Therapy at Chicago's Edgewater Hospital, were Co-chairmen of the Inhalation Therapy Section.

The first session was Tuesday morning, April 29, and was comprised of three talks. Gareth B. Gish of Puritan Compressed Gas Corp., Kansas City, Mo., spoke on, "The Problem of Back Pressure in Inhalation Therapy." He explained

Dr. Matson Dr. Snider Miss Egan Dr. Rankin Dr. Levine Dr. Andrews

the differences between various kinds of flow-metering equipment, particularly the Bourdon Tube and Thorpe Tube types. Subsequently, he showed the limitations of the Bourdon type, in that it operates on the principle of back pressure. He stated that much of our modern equipment imposes a back pressure downstream from the flowmeter resulting in falsely high readings. He also discussed the development of modern back pressure-compensated flowmeters.

This was followed by a presentation on, "Oxygen Therapy in the Home," by Robert Kruse of Aamed Rents, Inc., Oak Park, Ill. The final address was given on, "Adaptation of Commercially Available Equipment for Positive Pressure Breathing," by Dr. George Saxton of Chicago, Senior Physician at the University of Illinois Respiratory Center. Emphasis was placed here on adaptation of vacuum cleaners for positive pressure breathing assistance for chronic respiratory cripples of the post-polio or other paralytic types.

The second session was held Wednesday morning, April 30. It was opened by a careful and thorough analysis of, "Inhalation Therapy and Nursing Care," given by Miss Kathlyn Y. Egan, R.N., New York, Oxygen Therapy Consultant, Linde Company. Miss Egan stressed communications. Pointing out that, since effective inhalation therapy depends on the doctor-therapist-nurse team, "it is of extreme importance that every member of the team knows exactly what his or her own responsibilities are," she said, "as well as what the others are expected to do." Should this sort of cooperation fail, no amount of equipment and help will produce the desired results. More frequent and thorough indoctrination of both doctors and nurses is necessary, stated Miss Egan, in order that the inhalation therapy department can outline what services and equipment are available, how equipment is operated (she recommends provision on every nursing unit of specific instruction sheets for each piece of equipment), why and how the doctor must prescribe more fully, what things the nursing staff should do, and what the inhalation therapy technicians will do. She recommended written records of when

service and equipment is checked and by whom, and that complete records of the therapy be incorporated in the patient's record on a separate sheet.

Dr. Gordon L. Snider of Chicago's Michael Reese Hospital, spoke on, "Inhalation Therapy for Ambulatory Patients." He dealt with the chronic lung disease patient, and focussed attention *away* from IPPB, pointing out that benefits were obtainable less expensively with the use of simple aerosol apparatus operated by foot pumps, or other inexpensive means of furnishing the necessary pressure for units which patients can use in their homes.

Dr. Snider thinks it is so important, in these days of rising hospitalization costs, to keep patients out of the house, if possible. It is time the hospitals took more definite steps towards lowering the number of re-admissions of chronic patients by renting equipment to them for home use, he said. The results of this practice at Michael Reese Hospital have been very gratifying according to Dr. Snider.

The session was closed by a panel discussion on, "The Future of Inhalation Therapy," moderated by Dr. Edwin R. Levine of Edgewater Hospital. The other panelists were: Dr. Albert L. Andrews of Chicago's St. Luke's Hospital, Dr. James E. Matson of Ohio State University Hospital, and Dr. John Rankin of the University of Wisconsin Hospital. Among things predicted for the future:

1) More use of assisted respiration techniques.

2) Advances in tent therapy by development of better control features. Other equipment design advances are already on drawing boards.

3) More tracheotomies will be done for routine prophylaxis instead of as emergency measures.

4) More study into what specific concentrations of oxygen are most beneficial in particular diseases.

5) More home therapy because of development of suitable equipment and expansion of home service company facilities.

6) More recognition of the role of inhalation therapy technicians, rise in calibre and training of personnel, development of schools, which would lead to registry of graduates.

It should be emphasized that the ultimate result of all these developments will be very greatly improved *service to the patient.*

There was a luncheon meeting

(Please turn to page 30)

Leah Tharaldson, board member from Minneapolis and Albert Carrière, Executive Director, discuss vital AAIT activities at the Board of Directors meeting held during Tri-State Hospital Assembly.

WHY WE NEED OXYGEN

By LEAH THARALDSON, R.N.*

IN THE BEGINNING of the world, all life existed in the form of single microscopic-sized cells. These cells lived in the sea, and each cell took the food and oxygen it needed to grow and live from the sea. As time in the world progressed, many cells banded together to afford greater protection. As cells became organized into communities they found it necessary to provide canals for the sea water to flow through, so that every cell would still be surrounded by water from which it had to obtain food and oxygen. The sea sponge is an example of this low form of life: the holes in the sponge are the canals through which the sea flows.

The body of man is the highest evolution of mammals; yet, man's body too is composed of uncountable numbers of single cells, each of which is completely bathed in fluid that is similar to primeval sea water. From this fluid each cell draws the food and oxygen it needs in the same manner as the single-celled organisms did in the beginning.

Notice that whenever food is mentioned, oxygen is mentioned too; of the two, oxygen is the more important to the well-being of the cell. Each cell draws food and oxygen into its substance, and through the process called metabolism, literally burns up that food. Burning the food in the cells produces the energy which the body uses to do its work. The body's most important work is to keep itself in repair; i.e., healthy, so that it is ready to perform the tasks required of it by the community.

Food and oxygen are dissolved in the blood and transported throughout the body by the blood vessels. When food is eaten, it is

Editor's Note: **Inhalation Therapy departments everywhere are becoming aware of the increasing need to educate those who help us carry out the doctors' orders by caring for our patients in our absence—the nurses and the attendants. Since they are actually with our patients more than we are, it is important for them to have at least rudimentary knowledge of what inhalation therapy is, and how to recognize whether its use is producing the desired effect.**

Anyone who has ever prepared a talk of the sort we're printing here knows that it is a hard job. It requires time and it requires access to materials not available to all. It also requires experience and teaching skill to know just how to organize material for the most effective presentation to a particular group.

It is for these reasons that we asked Mrs. Tharaldson if she would be willing to make this lecture available to other AAITers who may find themselves faced with the need to develop similar orientation talks for groups in their hospitals.

*Director, Inhalation Therapy Department, Northwestern Hospital, Minneapolis, Minn.

digested by the stomach and intestines. When reduced to sufficiently simple form, it is absorbed into the blood and stored in the liver; from the liver storehouse the blood withdraws a little food at a time and distributes it to the cells. Because the body has a storehouse for food, we are able to maintain health by eating only once or several times a day. If we eat more than can be stored in the liver, the body saves the extra food in another storehouse, the body fat.

But cells require oxygen as well as food to produce energy. Oxygen is breathed into the lungs along with the other constituents of air, and blood vessels in the lungs take oxygen from the air and circulate it to the body cells. There is no need for preparation of oxygen to make it acceptable to the blood and cells. Oxygen as it exists in the air is in the chemical state which allows it to be absorbed into the blood and used by the cells, because atmospheric oxygen exists in its elemental form.

While food can be stored in the liver or as fat, **the body has no facilities of any kind for storing oxygen.** If, for any reason, the source of oxygen should be cut off —i.e., respiration should be stopped—the brain would begin to die in about three or four minutes, and the heart would stop beating in eight or ten minutes.

Plasma and Cells

The blood is composed of plasma and cells, and it is pushed through blood vessels all over the body by the pumping action of the beating heart. Plasma is the liquid part of the blood, and it roughly resembles the chemical composition of the prehistoric sea in which all life floated as one-cell organisms. The blood cells float in the plasma just as prehistoric life floated in the sea. Plasma is clear, straw-colored, salty to taste, sticky to feel. When you see blood it is red; the reason for the red color is the tremendous number of red blood cells which float in the plasma. There are about five million of them in one cubic millimeter of blood. Approximately 45% of the blood is red cells.

The red cells are carriers of oxygen. They contain hemoglobin, a protein, which is bright red when it is loaded with oxygen. Red blood cells also carry carbon dioxide, which is the smoke from the fire in the cells. That is, the cells use oxygen to burn food and produce energy; as is true of any fire, smoke is produced and carried away as waste. Cell smoke is carbon dioxide.

The left side of the heart pumps oxygenated arterial blood all over the body; as the blood passes through capillaries in the tissues it unloads more than half of its oxygen, which diffuses through the plasma, out the capillary walls, and into the fluid which surrounds each cell. The cell absorbs oxygen from the fluid around it; at the same time, the cell pours out the smoke from its fire into the surrounding fluid. This smoke (carbon dioxide) seeps through the capillary wall into the plasma and is loaded onto the red blood cells. They have enough room for carbon dioxide because they have just unloaded more than half their supply of oxygen. The blood then leaves the capillary bed and is returned to the right side of the heart. This venous blood with a low oxygen

supply is then pumped to the lungs where it is spread into another capillary bed, stretched like a net over the outside of the lung sacs or alveoli.

Air is breathed into the lungs through the nose or mouth, goes through a number of air passages and finally reaches the air sacs or alveoli deep in the lungs. The walls of the air sacs are estimated to have about 70 square meters of surface area, which is about 25 times the total area of the body skin surface. Inhaled air becomes so highly humidified in the air passages that it is almost liquid as it enters these tiny pouches, which have walls so thin that they cannot be visualized except under a microscope. Here in the alveoli oxygen leaves the air, crosses the alveolar wall, and enters the capillaries where it is loaded into the red blood cells. Here, too, at the same time, the red blood cells unload their carbon dioxide, which diffuses into the air in the alveoli, whence it is exhaled into the atmosphere.

Three Gases

The air is made up of three major gases. It is composed of 79% Nitrogen, 20.96% Oxygen and about 0.04% Carbon dioxide. There are a number of other gases in the air, but they exist in such minuté quantities that they are called "traces." Note, please, that roughly 1/5 of the atmosphere is composed of oxygen.

At sea level the atmospheric blanket of the earth presses upon the earth's surface with a force equal to 760 mm of mercury. The weight of this blanket of air is known as barometric pressure.

The hemoglobin of the red blood cells has such a high affinity for oxygen that the blood in the lung capillaries is able to become 100% oxygenated in less than a second, even though air is only 1/5 oxygen. This is true of people who are well and located not higher than 3500 feet above sea level. In hospital care of patients, we are not usually concerned with total lack of oxygen—i.e., cessation of breathing, or acute asphyxia. We are more apt to be taking care of patients who may have one of the four forms of hypoxia. Hypoxia means low blood oxygen, and is often also called anoxia. There are four basic kinds of anoxia:

Anoxic anoxia: A condition wherein the blood does not become 100% oxygenated while in the lungs because of disease there. Pneumonia, cancer of lung, tuberculosis, pleurisy and heart disease cause this kind of anoxia.

Anemic anoxia: A condition of low blood oxygen caused by insufficient red blood cells or hemoglobin to carry the oxygen. Hemorrhage, anemia, and carbon monoxide poisoning cause this kind of anoxia. It is usually treated by whole blood transfusions and possibly oxygen therapy.

Stagnant anoxia: A condition of low blood oxygen caused by circulatory collapse or shock. The treatment for this form of anoxia is whole blood transfusions and stimulants (vasopressors).

Histotoxic anoxia: A condition where there is plenty of oxygen in the blood, but the cells can't use it. This is the cause of death in cyanide poisoning.

Low oxygen tension in the arterial blood is usually treated by using oxygen therapy to accomplish higher tension or percent of oxygen in the blood by elevating the percentage of oxygen in the inspired air. In pneumonia, bron-

chitis, heart disease, operations for removal of a part of the lung, and at high altitudes, the blood is able to become 100% oxygenated only if there is more than 21% oxygen in the air.

Oxygen therapy is applied by a number of methods, but the goal of all methods is to elevate the oxygen fraction of the air considerably above 21%. If the area of usable lung is cut in half—that is, to 35 square meters instead of 70 square meters, we will still be able to oxygenate our blood to 100%, if we increase the oxygen content of the air from 1/5 to 1/2 or more. Oxygen is highly diffusible, and in order to increase the content this much, the inspired air must be in a closed container, or pure oxygen must be poured into the air deep in the throat so it can be inhaled before being diffused or diluted.

There are three kinds of equipment used to raise oxygen percentage in inspired air.

Oxygen Tents

An oxygen tent is a canopy made of plastic or airproof material which is hung from a pole above the patient, and snugly tucked beneath the mattress to prevent leaks. Oxygen is poured into the atmosphere within the canopy until the percentage reaches that ordered by the doctor. The patient's head and shoulders are inside of the tent, and the air soon becomes moist and warm; therefore, the high oxygen atmosphere is made to circulate over a cooler. The cooling device may be a refrigerator unit or an ice chest.

Things that should be checked when caring for a patient in an oxygen tent are as follows:

Oxygen must always be on. Remember the reason for the therapy is to elevate the oxygen percentage of inspired air.

The canopy must always be well tucked-in to avoid leaks and loss of oxygen into the room.

The circulating fan must be running or the tent air will not be cooled.

Neither the patient nor anyone in the room should ever smoke, since the high oxygen atmosphere around the patient will cause any fire to burn much faster and hotter.

Oxygen masks

All kinds of masks are designed to raise the concentration of oxygen in the inspired air. The air with high oxygen content is inhaled from a small bag. The bag contains just a little more gas than the patient will inspire; i.e., the oxygen should be running into the bag fast enough to partially refill the bag before the patient begins to exhale. Most of his exhaled breath then passes out through holes in the side of the mask.

This kind of therapy is most comfortable for patients who do not use it all the time, or who start it themselves when they need it. However, mask therapy used for long periods of time is usually disagreeable to the patient, because he has to take it off to eat, has difficulty making himself understood, and the mask makes the face warm and moist.

Nasal Catheter

In this type, too, the purpose is to elevate the oxygen percentage in the inspired air. A catheter is placed in a nostril and passed backward until it rests in the throat. Pure oxygen is applied through the catheter, and when the patient

inhales, he inhales more oxygen than he would get if he were breathing air. The catheter has these advantages: It is not distressing to the patient to receive oxygen via this method, if the liter flow is kept at 4 or 5 lpm (liters per minute). The patient can eat, talk, sleep, or turn in any position.

Things that should be checked in caring for a patient with a nasal catheter:

The tip of the catheter should be visible just below the palate in the posterior throat. If the catheter is inserted too far, the patient will keep swallowing air; he cannot use the oxygen he has swallowed, and it will soon make him uncomfortably distended.

The oxygen must be bubbled through water when administered via catheter to prevent excessive drying of the breathing passages.

The catheter should be removed and washed at least twice daily.

It must be lubricated with a water soluble ointment before being inserted. If oil is used, the patient may inhale droplets which would be detrimental to the lungs.

The attendant must **never** manipulate any oxygen gauge with greasy hands. Oil and water don't mix, but oil and oxygen mix to explode with the force of dynamite, shattering metal and flesh, and setting fire to any flammable object within range.

Inhalation therapy may encompass administration of high humidity, of medications, of washed cooled air, as well as special prescriptions of oxygen, helium, carbon dioxide or air.

Symptoms of anoxic anoxia, which one should be able to recognize are: Headache, depression, apathy, slowness of thought and reactions, weakness, sleepiness or insomnia. Usually the victim of anoxic anoxia will be nauseated. The heart beats faster, the breathing is faster, and if the oxygen content of the blood is low enough, there may be cyanosis.

Cyanosis

Cyanosis means blue color of the skin. Hemoglobin, the protein in the red blood cells, becomes bright red when the blood is fully oxygenated, and the red color shows through the skin in white-skinned people. If the blood is not fully oxygenated, the hemoglobin will be a duller color, and this darker blood showing through the skin gives it a blue look that is called "cyanosis."

Cyanosis need not be present in a person who has anoxia, but ordinarily when cyanosis is present the person has anoxic anoxia and will benefit from inhaling 50% or more oxygen.

All modern hospitals are equipped to administer oxygen therapy, which consists of considerably more than setting up the necessary equipment. Actually, an oxygen therapist must understand basic physiology and the part oxygen plays in metabolism. He must understand the mechanics and maintenance of each piece of equipment, and he must know nursing procedures very well, so that he will be able to make the patient comfortable while he is receiving the therapy ordered.

It is the business of ward attendants to keep a close watch on all patients who are receiving oxygen therapy. The attendants should

(Please turn to page 30)

NOW *a nebulizer...*

for every requirement

AEROSOL THERAPY EQUIPMENT

FOR

continuous, intermittent or occasional treatment periods.

DeVilbiss nebulizers, of proven reliability, create medication particles of suitable and effective size to reach all recesses of the lungs and bronchi.

NO. 841 continuous-flow nebulizer—compressor combination. Variable output regulator controls delivery rates.

Nebulizer combination, complete with nasal tips and oral adaptor.
Retail.....$6.50

Bulb operated nebulizer for medium volume.
Retail.....$2.50

Bulb operated nebulizer, for maximum volume.
Retail.....$3.50.

Pocket size, bulb operated, nebulizer. Leakproof, convenient to carry.
Retail.....$5.00

All DeVilbiss Nebulizers are constructed to precise tolerances, assuring correct particle size for effective aerosol therapy.

DEVILBISS

Since 1888 ... three generations of physicians have used and prescribed DeVilbiss

SOMERSET, PENNSYLVANIA

A New Neck Closure for Iron Lungs

THOSE WHO have assisted in the care of patients in full tank respirators will recall the difficulties experienced in getting an airtight seal around the patient's neck which is not uncomfortably snug. In addition, there has always been the problem of patients' tracheotomies—and this is common with respirator cases—of getting access to the tracheostomy.

The first iron lung collars were simply sponge rubber doughnuts. Actually, they were made of a sheet of very thin rubber with thicker sponge rubber layers cemented on each side. As air seals, they were very effective, and, at the time of their introduction, there were few iron lung patients who had tracheotomies, so these collars were successful.

The advent of more tracheotomized respirator patients, however, brought up the problem of how to gain access to the tracheostomy and, at the same time, maintain the air seal and the epithelium of the patient's neck intact.

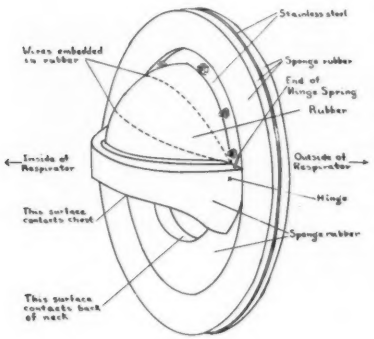


Figure One

Several manufacturers had developed spiral plastic closures which were more comfortable to the skin, but which presented the same difficulty in access to the tracheostomy. Various metal depressor bars were devised to push the upper part of the collar out of the way—with the uniform result (with either sponge rubber or spiral plastic) of introducing leaks around the sides of the collar. It was then necessary to stuff these leaks with gauze pads, towels, etc.

Finally a cone-shaped collar was designed, with zipper openings on each side. This was easier to get on and off the respirator, came in many sizes, was easy to get the patient's head through (with zippers open), and its shape permitted wire retractors to hold the part over the tracheostomy away from the chin without, simultaneously, causing leaks at the sides.

Another development at about the same time, which made the tracheotomy area a little easier to get at, was the introduction by the respirator companies of the sloping front on the head-end of the tank.

In actual practice, all sorts of make-shift arrangements have had to be used to maintain a seal and accessability and there have been many instances where nothing seemed really satisfactory. Usually

Figure Two

the biggest difficulties have been encountered where the patient has a short neck or a low-placed tracheostomy. Either situation places the opening right at the edge of the collar, where the latter rubs over the tracheotomy tube and produces much patient discomfort and, often, ulceration of the trachea.

About a year and a half ago, a woman named Lola Cyphers with Guillain-Barré syndrome was placed in an iron lung in the University Medical Center at Rochester, New York. Her condition remained so poor that she was more in than out of the respirator for 7 or 8 months; during much of this time there was collar trouble, in spite of trying all the available types mentioned above.

Her husband was a machinist-designer, and the failings of all the collars were a challenge to him to design one which would get around them and still fill the bill. The idea he came up with was that since successive improvements to the original idea of sealing around the neck had remained unsuccessful, why not put the seal on the patient's chest? This would avoid soreness of the neck skin on the sides and front, and would give unlimited access to the tracheotomy area clear down to the breastbone.

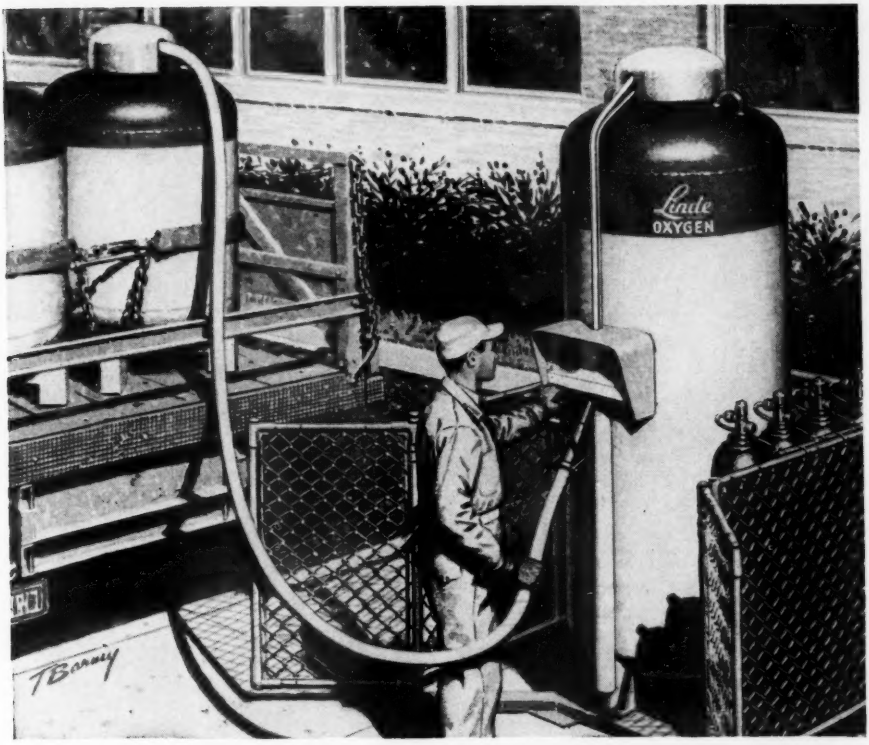
For nearly a year, Harold Cyphers worked at designing a new collar for respirators. He brought successive working models to the hospital for trial, and had extensive discussions with doctors, nurses, inhalation therapists, and with the patients using the collar.

After many months of such trial and improvement, it was the consensus at the medical center that this was a definite contribution to the care of respirator patients. Now the collar has been patented and is in production.

Figure 1 shows a side view drawing of the collar. It is fastened to the head-end of the respirator by the retaining ring used for holding on any of the others. The hinge (hidden underneath the rubber) incorporates a spring which automatically brings the sealing edge down until it contacts the patient's chest. The arched hood has two heavy wires molded right into the rubber, which maintain the arch against the positive pressure inside the tank during expiration.

Figures 2 and 3 show two views of the collar in use on a subject without a tracheotomy. Fig. 2 shows how far down on the chest the sealing contact is made. Fig. 3 shows the abundant space between the chin and the top of subject's undershirt, showing under the sealing edge. There is also admirable

NOW...with LINDE's expanded service



...more hospitals can have LIQUID OXYGEN!

LINDE's new ATX liquid oxygen storage and converter unit is just what many hospitals have been waiting for! It offers the greater efficiency and economy of a liquid oxygen system.

Liquid oxygen for the ATX unit is supplied by your local LINDE distributor as well as directly from LINDE. The unit can be installed on a level area of 5 x 5 feet. No capital investment on your part is required.

If your location or consumption rate has made it impractical for you to utilize oxygen in liquid form, find out now whether you can benefit from this new ATX unit with local service.

For information, call your nearby LINDE Distributor or LINDE office. Or write Dept. IY-6, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde TRADE-MARK UNION CARBIDE

The terms "Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

"head room" above the tracheotomy site, which greatly facilitates suctioning, removing inner cannula for cleaning, and other patient care.

Figure Three

The Salk vaccine has practically eliminated the paralytic polio patient from general hospitals; nevertheless, we continue to use full tank respirators for various other conditions, such as the Guillain-Barré Syndrome which Mrs. Cyphers had, emphysematous patients in CO^2 narcosis, and barbiturate poisonings. Therefore we still feel that this new collar is definitely worth bringing to the attention of all who are involved with the occasional respirator patient.

CHAPTER ACTIVITIES

By Jack Sangster

The Ohio Chapter of the A.A.I.T. met at St. Luke's Hospital, Toledo, Ohio. The meeting was called to order by the President, Mr. Bernard Kew. The speakers were: Mr. H. E. Richards, who spoke on "Conductive and Non-Conductive Rubber," and Mr. J. Snoddy, who spoke on "Resuscitation." Mr. Abram D. Jackson is the oxygen therapist at St. Luke's.

The Greater Montreal Chapter had its January meeting at the Montreal Neurological Institute on January 28, 1958. The President, Mr. Sharkey, introduced adviser, Dr. Guy Fortin of Notre Dame Hospital, who spoke briefly on, "Resuscitation." Mr. Guenter Sainitzer, oxygen therapist at the Institute, demonstrated the new Hypothermy Bed and Basque Respirator.

The *February* meeting was held at the Hotel Dieu Hospital on February 25. Mr. Georges Robert, Vice-President, introduced the speaker, Dr. Leon Longtin, Professor of Anaesthesia, University of Montreal, who spoke on, "Tracheotomy and the Inhalation Therapist." Mr. Henri Dreyfus also demonstrated the Bird Residual Breather Mark VII.

The March meeting was held at The Montreal General Hospital. This was a last minute change, so no speaker was presented. Mr. Higgs of Linde Air Co. showed two films, "Oxygen Dosages and Techniques," and, "The Breath of Life." The members then held a

discussion on mask therapy. Mr. Lachapelle demonstrated the new Ohio Non-Rebreathing Mask. The executive members, aside from those mentioned, are: R. Merry, Treasurer; J. Sangster, Secretary; and M. Roy and J. Parent, Directors.

The Western N.Y. Chapter February meeting was again held at the Veterans' Administration Hospital in Buffalo. There was a record attendance to hear the address given by Dr. Theodore Noehren of the Research Staff of the Buffalo General Hospital. His subject was, "The Uses of Intermittent Positive Pressure Breathing." He used graphic illustrations, slides and pre-op and post-op pulmonary function studies, and follow-up case histories. He proved there is less danger when giving IPPB treatments with compressed air than with oxygen. The general meeting was informed that Drs. Charles Mathews and R. M. Lawrence of Rochester have consented to serve as advisors to the chapter.

The March meeting was held at the University Medical Center in Rochester. An emblem designed by Mrs. Whitacre was chosen as the official Chapter Emblem. Six new doctors have agreed to serve as advisers. They include: Dr. Edward Cordasco, Niagara Falls; Dr. Francis W. O'Donnell, Buffalo; Dr. Dean Babbage, Buffalo; Dr. H. Paul Longstreth, Snyder, N.Y., and Dr. Annabel Miller, Buffalo. The members were addressed by Dr. Charles Mathews of the Department of Medicine, St. Mary's Hospital, Rochester, who spoke on "Cardiopulmonary Dynamics." It was unanimously agreed that a social period should be held after each meeting so the members can have more contact.

The **Illinois Chapter** held a one-day workshop on the Sunday before the annual Tri-State Hospital Assembly at Edgewater Hospital. Dr. Edwin R. Levine of the AAIT Board of Advisors was the principal speaker.

There were demonstrations of various types of inhalation therapy equipment and a display of equipment by manufacturers and their representatives in the hospital auditorium.

Principal topic of discussion was "The Use and Administration of IPPB and Exsufflation". Other topics covered by speakers and discussion groups included: "The Necessity of Establishing an Inhalation Therapy Department" and "Routine Records and Procedures".

The **Florida Society of Inhalation Therapists** met April 15 at Jackson Memorial Hospital in Miami with President Norman Rush presiding. Dr. J. G. Converse, Director of the Department of Anesthesiology at the University of Miami Medical School was the speaker of the evening. His discussion centered on the mechanics of breathing and covered ventilation, cough reflexes and the effect of pressure breathing units on the flow of venous blood.

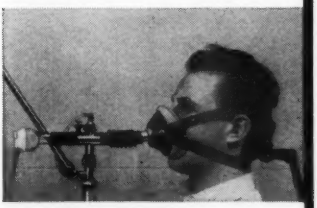
The Chapter made arrangements for the talk to be tape recorded so that members who could not attend the meeting might have the benefits of hearing the talk and the ensuing discussions at a later date.

Improved M-S-A®
Pulmonary Ventilator

Provides pressure breathing therapy (I.P.P.B.) in combination with aerosol therapy; respiratory tract distribution of bronchodilators, detergents, etc. New easy-to-clean, maintenance-free exhalation valve. Provides both dilution and 100% oxygen. The Mobile Model (shown), mounted on a pedestal, can be moved easily anywhere in the hospital, clinic, physician's office or home. Operates from either a piped system or an oxygen cylinder. Write for details.

M-S-A Demand Pneophore

This versatile instrument provides automatic resuscitation or therapeutic inhalation when desired. Ideal for treatment of apnea and pulmonary edema. Can be used from any oxygen cylinder or piping system. Write for details.



M-S-A Positive Pressure
Therapy Mask

Provides a comfortable leak-tight fit against the face of the patient. Used with Pulmonary Ventilator or other intermittent positive pressure therapy instruments.

MSA's complete line of artificial respiration and inhalational equipment is easy to operate... dependable in service

M-S-A Oxygen Therapy Unit

Supplies oxygen on inspiratory demand or fingertip control to patients with voluntary respiration. Excellent for the cardiac. Fits any oxygen cylinder or piped system. Write for details.

SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue
Pittsburgh 8, Pennsylvania

Why Oxygen

(Continued from page 20)

understand how to adjust the equipment, how to tell if it is working properly, and most important of all, how to reapply the special equipment after it has been removed in order to perform a treatment of another nature.

The attendant cannot be expected to know all the aspects of administering oxygen by the various methods. He will be respected, however, for understanding that any patient who is receiving oxygen therapy cannot get enough oxygen from ordinary air to satisfy his needs. When scheduled to attend a patient receiving oxygen therapy, the attendant should make sure he understands the working principle of the particular equipment the patient has. He should be certain of the flowmeter setting before turning it off for any other treatment, so that therapy may be resumed in a way as to produce the same effect as before. Whenever he is not sure that the apparatus is delivering enough oxygen, the attendant should call someone to come and check it with an analyzer.

Inhalation therapy is, itself, fairly expensive to the patient; however, when one considers that often the patient is hospitalized just in order to receive it, expense and inconvenience because of hospitalization are wasted if the therapy is ineffective due to the carelessness or disinterest of the attendants.

If the patient has to breathe with effort to get enough oxygen for his body needs, he will not be interested in eating or talking or any other activity. His entire attention will be concentrated on the effort he must make to get air. When oxygen is added to the air he breathes, he will not be required to work so hard to breathe, and, therefore, will again become interested in food and other treatments that are ordered to help him recover his health.

While oxygen therapy is, of course, not the most important hospital treatment, if it is ordered for and needed by the patient, it is apt to become the *most* important from the patient's point of view.

Tri-State Meeting

(Continued from page 15)

of the AAIT Board of Directors on April 30. The Executive Director's report revealed the association now has over 600 members, and that fewer members were dropped this year because of failure to pay dues. The association's legal counsel is still working on problems of getting non-profit status, chapter incorporations and revisions of the constitution and by-laws. Plans were discussed for the program of the annual meeting of the AAIT to be held this November in St. Louis.

Mr. Noble Price, Methodist Hospital, Indianapolis, Indiana, and Mr. J. H. Newell of American Medical Oxygen Service, Hammond and Gary, Indiana, were named co-chairmen of the Inhalation Therapy Section of the Tri-State Hospital Assembly for 1959.

NOW IMPROVED CONDUCTIVE RUBBER ACCESSORIES FOR THE ANESTHESIOLOGIST

Look at all these advantages:

- Greater tensile strength, increased flexibility.
- Longer life. Can be sterilized repeatedly.
- Colorfast—non-bleeding—will not stain.
- Improved Davol designs are anatomically correct, more comfortable.
- All items meet recommendations of the National Board of Fire Underwriters. (N. F. P. A. Standard No. 56)

DAVOL CR PRODUCTS FOR OPERATING ROOM USE

Contour Face Inhalers

New improved Davol face masks are designed to fit the face firmly. Flexible, self-sealing flange characteristic provides maintenance of a closed circuit.

Child and adult sizes—for Heidbrink

Head Straps

Designed for use with the Davol Contour as well as most other brand face inhalers. Fit snugly on back of head—assemble easily.

Child and adult sizes

Rebreathing Bags

Seamless, one-piece construction. Designed to fit majority of gas machines. Available in 5 capacities and multiple size neck openings. Each bag fitted with hang-up loop.

With or without insert—for Foregger, McKesson and most Heidbrink

Corrugated Inhaler Tubes

New, exclusive, heliciform non-kink design reduces turbulence, lessens resistance, induces more normal respiratory cycle. Tubes 18", 24" and 34" lengths.

⅞" opening for Foregger-Heidbrink
1" opening for McKesson

All available at your hospital supply dealer.

For a detailed description of the items listed above, write: Davol Rubber Company, Dept. IT-8-6, Providence 2, R.I.

DAVOL® RUBBER COMPANY
PROVIDENCE 2, R. I.

Dr. Collins in New Post

Dr. Vincent Collins has become a professor on the faculty of New York University and is on the staff of Dr. E. A. Rovenstine, chairman of the Department of Anesthesiology. Dr. Collins is a member of the Board of Advisors of the American Association of Inhalation Therapists having been appointed to the Board by the American Society of Anesthesiologists. He was formerly in charge of Anesthesia at St. Vincent's Hospital in New York.

Mask Therapy for the Dyspneic Patient

Many dyspneic mask patients really *need* a demand type regulator to supply enough gas. These regulators have two disadvantages: (1) they are much more costly than ordinary flowmeters, and (2) they usually cannot be used with a humidifier of any sort, which results in giving the patient high flows of dry gas—not good therapeutically.

Increasing use of "jet" or nebulizer type humidifiers results in more and more flowmeter-humidifier combinations which cannot deliver more than 10 or at most 15 liters of gas per minute, because of restricted orifices of the nebulizer or jet arrangement inside the humidifier.

Further, flowmeters used with mask setups in most hospitals have no "flush" positions, and will, therefore, not deliver over 15 liters per minute.

A really dyspneic patient makes peak inspiratory demands in excess of 25 liters/minute, and the most desirable sort of mask would be a non-rebreathing type which supplies humidified oxygen—enough to meet this demand. We have found the nearest thing to a costly demand regulator with coupled humidifier (not commercially available anyway!) is the combination of a flowmeter with a "flush" position, with a humidifier of the porous stone type. It is necessary also to choose a humidifier which does not dump everything over 10 liters/minute out its safety release port.

Here, both the flowmeter and the humidifier will pass over 20 liters/minute, if necessary, and keep the mask bag inflated during that critical period when the patient most needs *quantities* of 100% oxygen. Usually he doesn't get it because the liter flow is not high enough, and he must supplement with room air, thus lowering the oxygen concentration. And there are certainly too many instances in which mask patients are being supplied with dry gas in order to obtain a better flow, or are being forced to use rebreathing type masks, which usually have small bags and use high flows of unhumidified gas. This type may also add the insult of high pCO_2 in the inspired air to the difficulties such patients already have.

Drying Effects of IPPB

While we're on the subject of dying the patient, here is another thought. One of the points emphasized at the Cleveland meeting last fall by a number of doctors and others in discussing IPPB was the fact that gas flows during inspiration are around 30 liters/minute. This would mean that for a 10-minute treatment, a patient receives—or rather, breathes from a reservoir of about 300 liters of dry gas, moistened only by about 3 cc of water or other fluid from the nebulizer. This is a grossly inadequate humidity. We are glad to see many others advocating the use of nebulizers with a larger volume output and hope that manufacturers will soon be able to provide us with equipment which will adequately moisten these large volumes of dry gas.

for better oxygen therapy...

NEW, IMPROVED APPARATUS from *Ohio Chemical*

THE OHIO-JET HUMIDIFIER

A jet stream of oxygen atomizes the water, exposing more surface to the gas, and then bubbles through surrounding water for maximum humidification. A warning sounds if tubing is obstructed.. Bottle is of unbreakable polyethylene plastic. For further information, *please request Bulletin 4759.*

"OHIO 100" NON-REBREATHING-TYPE OXYGEN THERAPY MASK

Soft latex rubber conforms to the face. The patient stays comfortable and free of pressure contact points. Dead space is minimized. The "Ohio 100" Mask can be converted quickly for aerosol therapy. For added information, *please request Form 4768.*

OHIO OXYGEN DILUTER

Specially designed for use with the "Ohio 100" Mask, this unit adjusts desired mixtures of pure oxygen and air from a low of 40% to a high of 95% oxygen. Once the oxygen concentration is set, you can adjust or change the flow without affecting the concentration. For further information, *please request Form 4768.*

"Service is Ohio Chemical's Most Important Commodity!"

OHIO *Ohio Chemical*

OHIO CHEMICAL & SURGICAL EQUIPMENT CO.
MADISON 10, WISCONSIN

Ohio Chemical Pacific Company, Berkeley 10, Calif.
Ohio Chemical Canada Limited, Toronto 2, Ontario
Airco Company International, New York 17, N. Y.
Cia. Cubaña de Oxigeno, Havana
(All Divisions or Subsidiaries of
Air Reduction Company, Incorporated)

AIRCO

ABSTRACTS

"Performance of Ventilators: Effect of Changes in Lung-Thorax Compliance," by James O. Elam, M.D., James H. Kerr, M.B., and Clinton D. Janney, PhD., in *Anesthesiology* 19:56 (1958).

When a patient is ventilated by an experienced anesthesiologist, variations in the compliance of his respiratory system are sensed by the anesthesiologist by the "feel" of the bag, and he can squeeze harder or easier, as indicated, to insure that the patient's tidal volume remains the same. However, when a mechanical ventilator is substituted for the trained hand of the anesthesiologist or anesthetist, the machine does *not* sense these variations in compliance (which might be here regarded as changes in the degree of *receptiveness* of the patient to the input of air from the ventilator). Because of this fact, ventilation of patients by machines is still usually not as satisfactory as by the skilled human hand.

In an effort to evaluate a number of ventilators presently available commercially, Dr. Elam's group devised a system whereby they could check the volumes and pressures delivered by each of the ventilators into each of a set of three compliance systems—three "test lungs," so to speak—of average, increased and decreased compliance. The paper gives interesting details of how the systems were set up and how the test recordings were made.

What they discovered is that ventilators can be divided into two classifications: (1) those which are "pressure-limited" and therefore deliver a *variable volume* of air to the lungs, and (2) those which are "volume-limited" and hence deliver a *variable pressure* to the lungs. Now under ideal conditions, both types of ventilators will deliver the desired tidal volume, because with the former the pressure setting is made in accordance with the physician's estimate of the patient's compliance, which would dictate what pressure would be necessary to inflate the lungs to a given tidal volume. In the latter type, of course, if you wish a 500 cc tidal, you simply set the volume control for 500 cc.

What was not known until recently, though, is the fact that during the course of anesthesia — and of some disease processes too — the patient's compliance may change. The result of this with type 1 ventilators would be that the patient would be either over- or under-ventilated, depending on which direction the compliance changed, because the fixed pressure setting would cause the machine to deliver more air to the lungs if the compliance rose, and less if it fell. With the type 2 ventilators, the volume of gas delivered would remain the same, but the pressure on it would increase if compliance decreased, and vice versa.

While it is not desirable to have large pressure changes on the respiratory system, it is even less desirable to have large fluctuations in the tidal volume. One or more of the respirators of the volume-limited type evidently incorporate, or can have incorporated on them, gauges which indicate when the patient's compliance is changing, and how much the pressure is increasing or decreasing, so that personnel can be aware of the change in the patient's condition and act accordingly.

NEW EQUIPMENT

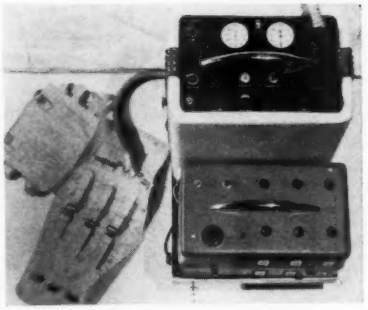
Power Unit

Conitech, Ltd., is introducing its new Multi-lung power unit for the operation of cuirass respirator, positive pressure via mouth or tracheotomy, or its Pneumo-belt, a girdle which contains an inflatable bag. The Multi-lung unit will serve two patients simultaneously or will provide one patient with two of the services at once or synchronously.

The Multi-lung, which supercedes the former Huxley Chest-abdomen Respirator power unit, delivers 14 to 24 respirations per minute. It will administer oxygen or other gases fed into its pump while being used with the attachment for positive pressure to the airway. In the event of power failure, it automatically switches over to D.C. from its battery, which will operate it for 4 hours maximum. This is also handy when moving patients or for outdoor excursions.

The Pneumo-belt is new in principle. It is a diaphragm-displacement type respirator, in which inflation of the bladder inside the girdle depresses abdominal viscera and causes the diaphragm to rise, producing exhalation. Inhalation is passive: i.e., when the bladder deflates, abdominal viscera sag and the diaphragm lowers again. However, if used with the positive pressure attachment, the latter will apply positive pressure to the airway while the Pneumo-belt is deflating, thus making inspiration more active, and accomplishing a larger tidal volume.

No. 321



BREATHING BELT

Residual Breather

A new pulmonary ventilation unit has been put on the market by the Bird Oxygen Breathing Equipment Co. called the Bird Residual Breather Mark 7, or simply Bird Respirator. It can be used for intermittent positive pressure breathing but is capable of much greater versatility than ordinary IPPB machines. It can produce results more nearly physio-

VENTILATOR

AMERICAN ASSOCIATION OF
INHALATION THERAPISTS
Room 904, 332 South Michigan
Chicago 4, Ill.

BULK RATE
U. S. Postage
PAID
Chicago, Illinois
Permit No. 1156

Form 3547 Requested.